

1 What is claimed is:

1 1. A rotational positioning device comprising:

2 a yoke for rotatably supporting an article, the article being rotatable relative to

3 the yoke about a first rotational axis;

4 a first voice coil actuator for causing the article to rotate about the first rotational

5 axis;

6 a base assembly, mechanically coupled to the yoke, the yoke being rotatable

7 relative to the base about a second rotational axis orthogonal to the first rotational axis;

8 and

9 a second voice coil actuator for causing the yoke and the supported article to

10 rotate about the second rotational axis;

11 whereby the article may be positioned about the first and second rotational axes

12 by adjusting current supplied to the first and second voice coil actuators.

1 2. The positioning device of claim 1, wherein the article comprises a video camera, the

2 first rotational axis is a substantially horizontal axis perpendicular to an optical axis of

3 the camera, and the second rotational axis is a substantially vertical axis.

1       3. The positioning device of claim 1, wherein the second voice coil actuator comprises a  
2       generally planar coil assembly comprising at least two coils to which current may be  
3       independently supplied.

1       4. The positioning device of claim 3, wherein the coil assembly is fixedly coupled to the  
2       yoke for co-rotation therewith, and the second voice coil actuator further comprises a  
3       set of concentrically arranged permanent magnets fixedly attached to the base  
4       assembly.

5. The positioning device of claim 1, further comprising a control system for controlling  
positioning of the article about the first and second rotational axes.

6. The positioning device of claim 5, wherein the control system further comprises:  
2       a set of sensors for continuously generating signals representative of the angular  
3       position of the article;  
4       at least one processor, coupled to the set of sensors, for receiving the signals and  
5       responsively adjusting the current supplied to the first and second voice coil actuators  
6       such that the article is caused to rotate in the direction of a desired angular position.

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1 7. Rotational positioning apparatus, comprising:  
2       means for supporting an article to be positioned;  
3       a base, mechanically coupled to the supporting means such that the supporting  
4       means and the article are rotatable about a first rotation axis relative to the base; and  
5       a voice coil actuator for causing the article and supporting means to rotate  
6       relative to the base, the voice coil actuator including a voice coil assembly fixedly  
7       coupled to one of the supporting means or the base, and a set of permanent magnets  
8       fixedly coupled to the other of the supporting means or the base.

1 8. The apparatus of claim 7, wherein the supporting means comprises:  
2       first supporting means fixedly attached to the article;  
3       second supporting means mechanically coupled to the first supporting means  
4       such that the first supporting means are rotatable relative to the second supporting  
5       means about a second rotation axis orthogonal to the first rotation axis; and  
6       actuator means for causing the first support means to be rotated relative to the  
7       second support means.

1 9. The apparatus of claim 8, wherein the actuator means comprises a second voice coil  
2       actuator.

1 10. The apparatus of claim 7, further including means for controlling an angular  
2 position of the article.

1 11. The apparatus of claim 10, wherein the means for controlling further comprises:  
2 angular position sensing means for detecting the angular position of the article  
3 and responsively generating angular position signals;  
4 processing means, electronically coupled to the angular position sensing means,  
for receiving the angular position signals and responsively adjusting current supplied  
to the voice coil actuator to move the article in the direction of a predetermined angular  
position setpoint.

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